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Computational Thinking for Teachers

Susan Imberman

CUNY College of Staten Island, susan.imberman@csi.cuny.edu

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CSC 711 Computational Thinking for Teachers

Catalog Description: This course is an introduction to computer science and computational thinking, and their classroom applications. Students will learn to use application tools in the content areas such as SCRATCH and App Inventor. The course will look at the definition and differences between the concepts of computational thinking, computer science, and educational technology, along with current trends in computer science education. Students will be required to complete hands-on projects in various computer science education platforms.

Textbook: Students will be required to read current research journal and conference papers in computer science education.

Course Objectives And Examples/Evidence That Objective Can Be Met:

Course Objective	Evidence Objective will be met
Students will be able to define and describe the concept of computational thinking	Students will read relevant journal and conference papers on the topic. Students will write a short paragraph summarizing each article.
Students will be able to explain and demonstrate the workings of the internet and how web pages work	Students will create a web page using JAVA script and html and upload their pages to the web using a File Transfer Protocol program. Students will create a cloud based web page using an online resource such as GOOGLE sites
Students will be able to identify what a computer programming language is, and demonstrate how it can be used to encourage computational thinking	Students will complete hands on projects in several types of computing languages. These can be stand-alone, i.e. NXT Lego Mindstorm software, cloud based, i.e. SCRATCH, App Inventor, or text based, i.e. Python
Students will outline the role of computer science in a K-12 curriculum	Students will read and become familiar with the CSTA computer science standards, the “Exploring Computer Science” curricula, and the AP computer science course “CS Principles”. Students will write a short essay on how these can be incorporated into a specific grade level.
Students will analyze the ethical issues involved in teaching in a computer science classroom for both teachers and students.	Students will be required to research the DoE guidelines on computing in the schools. Students will research and write a short paper on the current issues for safe computing in the schools.

Course Requirements:

Each week there will be an assignment that should be completed by the following week. Although you will have time during class to work on your assignment, you may not be able to finish during class time. Weekly assignments are the core of this course. You are graded on how much of the assignment you were able to complete, and how well you accomplished the set tasks.

At the end of the semester you will be responsible for a final project, the details of which will be told you in week 12.

SCHOOL POLICY on Academic Integrity, Plagiarism, and Cheating Integrity is fundamental to the academic enterprise. It is violated by such acts as borrowing or purchasing assignments (including but not limited to term papers, essays, and reports) and other written assignments, using concealed notes or crib sheets during examinations, copying the work of others and submitting it as one’s own, and misappropriating the knowledge of others. The sources from which one derives one’s ideas, statements, terms, and data, including Internet sources, must be fully and specifically acknowledged in the appropriate form; failure to do so, intentionally or unintentionally, constitutes plagiarism. Violations of academic integrity may result in a lower grade or failure in a course and in disciplinary actions with penalties such as suspension or dismissal from the College.

Students will be required to register for a GOOGLE Plus (gmail) account.

Course Outline

Week	Topic
1	Introductions, What is computational thinking? Read Jeanette Wing's seminal article on Computational Thinking. http://www.cs.cmu.edu/afs/cs/usr/wing/www/publications/Wing06.pdf Read the issue of CSTA(Computer Science Teacher's Association) Voice on CT http://csta.acm.org/Communications/sub/CSTAVoice_Files/csta_voice_05_2011.pdf I don't know what CT is but I know it when I see it... https://www.science.org/content/article/computer-algorithm-may-speed-drug-discovery
2	Internet - How does the internet work? What are web pages. Project - using computational thinking skills to create a class web page using JAVA script and HTML
3	Internet continued - Adding more to the class web page using JAVA script and HTML. What is an ftp program? How do we use it to show our web pages to the world? Project - using computational thinking skills to create a class web page using JAVA script and HTML and upload this to the internet. What is "the cloud"? Use GOOGLE sites to create a class web page using the cloud.
4	Computational Thinking - Programming languages - Why are there so many? What works best with students? Controversies on the "best" first computer language. Educational programming environments - NXT LEGO robotics, App Inventor, SCRATCH, JAVA, JAVA script, Python. Common Core and Computational Thinking Programming with Robots - choreograph a dance with your robot
5	Programming with Robots continued. More complex programming constructs
6	Cloud based programming environments https://code.org/ Let's SCRATCH, http://scratch.mit.edu/
7	Reusable code - SCRATCH remix
8	Advanced "SCRATCH" - SNAP - Build Your Own Blocks
9	Mobile Apps - What's an App? App Inventor - creating Android apps http://appinventor.mit.edu/explore/
10	More App Inventor - create an app that you can use in your content area
11	Text based programming languages - An introduction to Python for teachers
12	Computational Thinking without a computer - CS Unplugged Computational Thinking on the "cheap" - Raspberry Pi, Arduino
13	Ethical Computing - Internet safety (phishing - take the phishing test), legal issues for putting student work on the internet, how social media has adversely and positively affected socialization during the teenage years. Final Project assigned
14	Computing curriculums K - 12: Exploring Computer Science , CS Principles , CSTA Computer Science Standards http://csta.acm.org/Curriculum/sub/K12Standards.html . How does the computer science curriculum map to Common Core Standards? NYS standards? State licensing requirements,
15	Final Projects due (finals week) New environments for teaching computational thinking are constantly being introduced. Choose two computational thinking environments, one which we studied in class and one that we didn't such as Alice, Greenfoot, Arduino robotics, and write a research paper comparing the two. Use scholarly conference and journal articles to support your analysis.

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